# Today's challenge of managing moisture levels in the broiler house

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One of the greatest challenges facing the broiler grower is managing moisture levels in the litter, especially during winter months.

With genetic improvements over the past 25 years, average daily gain and daily feed consumption have almost doubled. Broilers consume approximately 1.6-2.0 times as much water as feed on a weight basis.

Along with increases in daily feed consumption come increases in water intake. Around 75% of the water consumed finishes up as water vapour or moisture in the litter. Cumulative water consumption at 28 days has also doubled over the past 25 years.

Many broiler houses still in production were built and designed more than 20 years ago, and the ventilation systems in many of these older houses have unfortunately seen very little change.

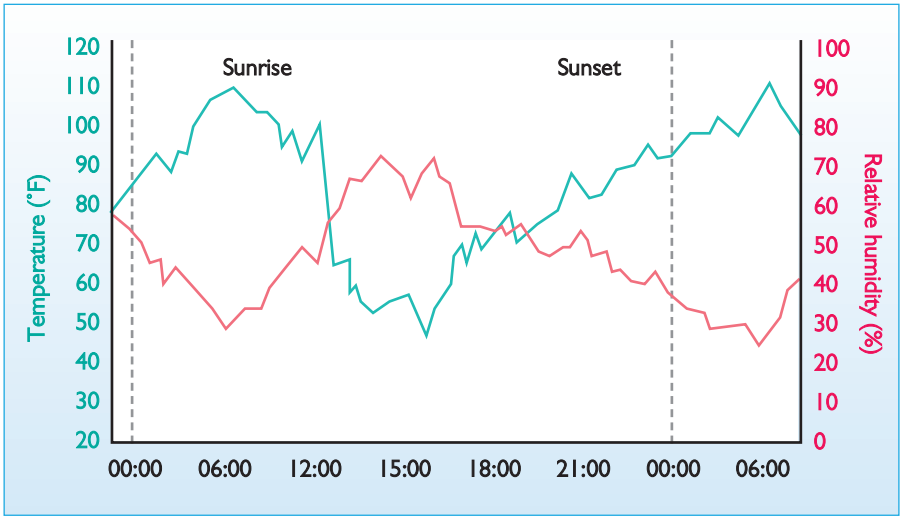


***Fig. 3. Temperature and relative humidity (M. Baker).***

## Cycle timer ventilation

A minimum or cycle timer ventilation system is designed to operate whenever the house is operating at set point temperature or below. This timer cycle can operate for the entire life of the flock in winter in many cold regions.

During the first 5-7 days the primary driver of this system is oxygen. Generally, after the first week moisture or water removal takes over as the driver for adjusting the timer ventilation system. If moisture is adequately managed, oxygen levels should be good.

The litter in a broiler house acts like a sponge with limited water holding capacity. Every day the chicks add moisture, and if the timer ventilation system falls behind by the latter part of the second week, the surface of the litter starts to show signs.

If the moisture content becomes elevated and the litter is allowed to become 'sealed', the birds are being grown on a continually damp, slippery and sticky surface. This sealed litter is often referred to as being 'caked'.

In this condition, the litter is simply saturated with water and the water is unable to escape. Then it is too late.

If litter is not kept in an acceptable condition, very high bacterial loads and an unsanitary growing environment may result producing odours including ammonia, insect problems particularly flies, soiled feathers, footpad lesions and breast bruises or blisters.

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***Fig. 1. Birds are constantly adding moisture, but litter is like a sponge with limited water holding capacity.***

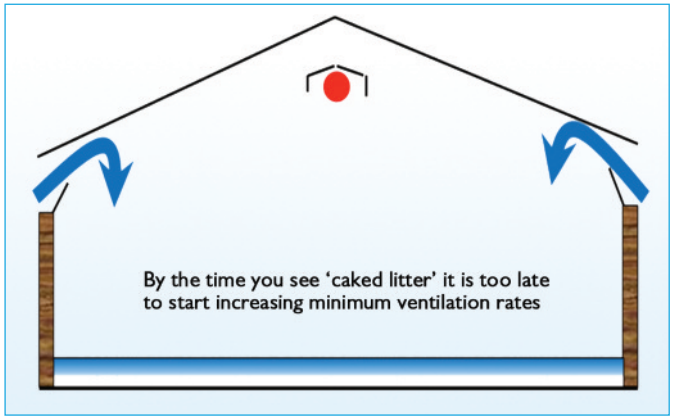
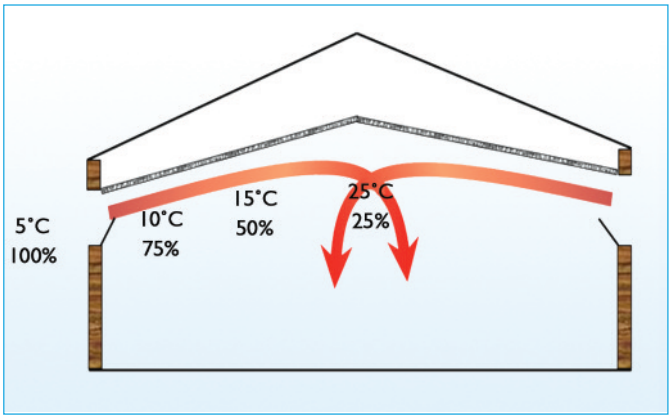



***Fig. 2. Keep air close to the ceiling. Maximise heating of incoming air and maximise moisture holding capacity.***



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In a well managed broiler house, litter moisture normally averages 25-35%.

Removing this moisture from the house requires replacing the inside air with cold outside air.

The key to keeping the litter dry is to ensure the incoming fresh air is 'conditioned' before it reaches the litter.

Incoming cold air will always contain moisture. By conditioning the air as it enters the house the moisture holding capacity of the air will change. The moisture holding capacity of the air changes with temperature, so incoming air needs to be heated before reaching the litter.

A 1°C increase in temperature will have a corresponding drop in relative humidity of 4.5%. Apart from conditioning, the incoming cold air needs to enter the house at the correct velocity. This will ensure it moves along the ceiling to the centre of the house before drifting to litter level.

| House width (m) | Pascal's/ inches water column | Air velocity m/s (fpm) | Distance air travels (m/ft) |
|---|---|---|---|
| 10 | 15 (0.06) | 5.0 (1000) | 5.0/16 |
| 12 | 20 (0.08) | 5.6 (1100) | 6.0/20 |
| 15 | 25 (0.10) | 6.4 (1250) | 7.5/25 |
| 18 | 30 (0.12) | 7.0 (1400) | 9.0/30 |

***Table 1. A general guide for air velocity and negative pressure in varying widths of poultry house.***

To achieve the correct velocity the house needs to ventilate under a negative pressure drop. The air exchange needed depends on bird age, gradually increasing from an initial 20% minimum ventilation runtime on a 300s timer.

Adjustment of cycle fan runtime should be based on air quality measurements, both carbon dioxide and relative humidity.

Table 1 is a general guide for both air velocity and negative pressure needed for varying widths of poultry houses.

## Operating rules

In tunnel houses with evaporative cooling systems, moisture management in summer depends on understanding some basic operating rules:

- All tunnel fans to be used before evaporative system turns on – house needs to be under maximum airspeed.
- Generally evaporative cooling should only be used between 9am and 5pm.
- Evaporative cooling is not to be used at house temperatures below 28-29°C.

The restrictions on use relate to the natural relationship between relative humidity and temperature. In all regions – even in the tropics – daily changes in both relative humidity and temperature follow a similar pattern (see Fig. 3 at the top of page 11).

In early morning and late afternoon temperatures are low and relative humidity (RH) is high. The crossover occurs at about 80% RH and 27°C (80°F).

The temperature drop attained through the evaporative cooling process does come at a price. For every 1°C drop in temperature, a corresponding 4.5% increase in RH is expected.

Operating evaporative cooling outside these times and at lower ambient temperatures will ensure moisture retention in the litter. If the air constantly moving over the litter has a relative humidity over 85%, the litter will never dry.

Understanding the challenges of moisture in both winter and summer will help growers improve litter conditions and overall environment conditions for the broilers. ■